CLAIMS

1. A multiply-complexed one-dimensional structure having a hierarchical structure in which a linear structure as an element of a one-dimensional structure having a finite curvature is made of a thinner one-dimensional structure having a finite curvature, comprising:

at least two layers of said one-dimensional structures bonded to each other in at least one site.

2. The multiply-complexed one-dimensional structure according to claim 1 wherein there is a fluctuation in bonding site between said at least two layers of one-dimensional structures.

3. The multiply-complexed one-dimensional structure according to claim 2 wherein said fluctuation appears in a predetermined pitch.

4. The multiply-complexed one-dimensional structure according to claim 1 wherein said fluctuation is introduced by removing or adding a bond between said at least two layers of one-dimensional structures.

5. The multiply-complexed one-dimensional structure according to claim 2 wherein phase transition occurring therein is controlled by controlling the bonding site between said at least two layers of one-dimensional structures.

6. The multiply-complexed one-dimensional

structure according to claim 5 wherein the control of the bonding site between said at least two layers of one-dimensional structures is effected by parallel movement of the bond.

7. The multiply-complexed one-dimensional structure according to claim 1 wherein the bonding itself in said at least one site is made of a linear structure.

8. The multiply-complexed one-dimensional structure according to claim 7 wherein critical temperature for ferromagnetic transition occurring therein is regulated.

9. The multiply-complexed one-dimensional structure according to claim 7 wherein critical temperature for ferromagnetic phase transition is regulated by selecting an intensity of the bond made by said linear structure.

10. The multiply-complexed one-dimensional structure according to claim 7 wherein a quantum chaos occurring therein is controlled.

11. The multiply-complexed one-dimensional structure according to claim 7 wherein an electron state thereof is controlled.

12. The multiply-complexed one-dimensional structure according to claim 11 wherein metal-insulator phase transition is controlled.

13. The multiply-complexed one-dimensional

structure according to claim 1 wherein the bonding itself in said at least one site is made via an independent element.

14. The multiply-complexed one-dimensional structure according to claim 13 wherein critical temperature for ferromagnetic transition occurring therein is regulated.

15. The multiply-complexed one-dimensional structure according to claim 13 wherein a physical property stable against small structural fluctuation is derived by a criticality obtained by the structure.

16. The multiply-complexed one-dimensional structure according to claim 13 wherein a quantum chaos occurring therein is controlled.

17. The multiply-complexed one-dimensional structure according to claim 13 wherein metal-insulator phase transition is controlled.

18. The multiply-complexed one-dimensional structure according to claim 13 wherein an electron state thereof is controlled.

19. The multiply-complexed one-dimensional structure according to claim 17 wherein metal-insulator phase transition is controlled.

20. A multiply-complexed one-dimensional structure having a hierarchical structure in which a linear structure as an element of a one-dimensional structure having a finite curvature is made of a

thinner one-dimensional structure having a finite curvature, characterized in:

exhibiting a nature regulated by setting a curvature in case the one-dimensional structure is made of thinner one-dimensional structures.

21. The multiply-complexed one-dimensional structure according to claim 20 wherein the curvature used when a one-dimensional structure of a first layer is made of a thinner one-dimensional structure of a second layer lower by one stage than said first layer is set to a value different from the curvature used when a one-dimensional structure of a third layer different from the first layer is made of a one-dimensional structure of a fourth layer lower by one stage than said third layer.

22. The multiply-complexed one-dimensional structure according to claim 20 wherein said curvature is set to vary in value depending on the difference in position in the one-dimensional structure of the layer.

23. The multiply-complexed one-dimensional structure according to claim 20 wherein there is a fluctuation in bonding site between said at least two layers of one-dimensional structures.

24. The multiply-complexed one-dimensional structure according to claim 23 wherein said fluctuation appears in a predetermined pitch.

25. The multiply-complexed one-dimensional

structure according to claim 23 wherein said fluctuation is introduced by removing or adding a bond between said at least two layers of one-dimensional structures.

26. The multiply-complexed one-dimensional structure according to claim 20 wherein said curvature is variable.

27. The multiply-complexed one-dimensional structure according to claim 20 wherein said one-dimensional structure is formed of a linear structure having an atom or a cluster of atoms as an element thereof.

28. The multiply-complexed one-dimensional structure according to claim 23 wherein said one-dimensional structure is formed of a linear structure having an atom or a cluster of atoms as an element thereof, and said fluctuation is introduced by random absorption or desorption of molecules to or from said linear structure.

29. The multiply-complexed one-dimensional structure according to claim 20 wherein phase transition occurs.

30. The multiply-complexed one-dimensional structure according to claim 20 wherein metal-insulator phase transition occurs.

31. The multiply-complexed one-dimensional structure according to claim 20 characterized in

including a portion in a metallic phase and a portion in an insulating phase.

32. The multiply-complexed one-dimensional structure according to claim 20 characterized in including a portion in a metallic phase and a portion in an insulating phase, said portion in an insulating phase being changeable to a metallic phase.

33. The multiply-complexed one-dimensional structure according to claim 20 wherein phase transition occurring therein is controlled by controlling the bonding site between said at least two layers of one-dimensional structures.

34. The multiply-complexed one-dimensional structure according to claim 33 wherein the control of the bonding site between said at least two layers of one-dimensional structures is effected by parallel movement of the bond.

35. The multiply-complexed one-dimensional structure according to claim 20 wherein ferromagnetic phase transition occurs.

36. The multiply-complexed one-dimensional structure according to claim 35 wherein critical temperature for ferromagnetic transition occurring therein is regulated by setting said curvature.

37. A multiply-complexed one-dimensional structure having a hierarchical structure in which a linear structure as an element of a one-dimensional

structure having a finite curvature is made of a thinner one-dimensional structure having a finite curvature, characterized in:

having a dimensionality regulated by setting a curvature in case the one-dimensional structure is made of thinner one-dimensional structures.

38. The multiply-complexed one-dimensional structure according to claim 37 wherein phase transition occurring therein is controlled by controlling the bonding site between said at least two layers of one-dimensional structures.

39. The multiply-complexed one-dimensional structure according to claim 38 wherein the control of the bonding site between said at least two layers of one-dimensional structures is effected by parallel movement of the bond.

40. A multiply-complexed one-dimensional structure having a hierarchical structure in which a linear structure as an element of a one-dimensional structure having a finite curvature is made of a thinner one-dimensional structure having a finite curvature, having a random potential introduced therein, and at least two one-dimensional structures bonded in at least one site, characterized in:

a quantum chaos occurring therein being controlled by setting the intensity of said random potential, by setting the intensity of layer-to-layer

bonding, by setting the curvature used when forming the one-dimensional structure from thinner one-dimensional structures, or by adding a magnetic impurity.

41. A functional material including in at least a portion thereof a multiply-complexed one-dimensional structure having a hierarchical structure in which a linear structure as an element of a one-dimensional structure having a finite curvature is made of thinner one-dimensional structures having a finite curvature, characterized in:

at least two layers of said one-dimensional structures being bonded to each other in at least one site.

42. The functional material according to claim 41 wherein there is a fluctuation in bonding site between said at least two layers of one-dimensional structures.

43. The functional material according to claim 42 wherein said fluctuation appears in a predetermined pitch.

44. The functional material according to claim 42 wherein said fluctuation is introduced by removing or adding a bond between said at least two layers of one-dimensional structures.

45. The functional material according to claim 41 wherein phase transition occurring therein is controlled by controlling the bonding site between said

at least two layers of one-dimensional structures.

46. The functional material according to claim 45 wherein the control of the bonding site between said at least two layers of one-dimensional structures is effected by parallel movement of the bond.

47. The functional material according to claim 41 wherein the bonding itself in said at least one site is made of a linear structure.

48. The functional material according to claim 47 wherein critical temperature for ferromagnetic transition occurring therein is regulated.

49. The functional material according to claim 47 wherein critical temperature for ferromagnetic phase transition is regulated by selecting an intensity of the bond made by said linear structure.

50. The functional material according to claim 47 wherein a quantum chaos occurring therein is controlled.

51. The functional material according to claim 47 wherein an electron state thereof is controlled.

52. The functional material according to claim 51 wherein metal-insulator phase transition is controlled.

53. The functional material according to claim 41 wherein the bonding in said at least one site

is made via an independent element.

54. The functional material according to claim 53 wherein critical temperature for ferromagnetic transition occurring therein is regulated.

55. The functional material according to claim 53 wherein a physical property stable against small structural fluctuation is derived by a criticality obtained by the structure.

56. The functional material according to claim 53 wherein a quantum chaos occurring therein is controlled.

57. The functional material according to claim 53 wherein metal-insulator phase transition is controlled.

58. The functional material according to claim 53 wherein an electron state thereof is controlled.

59. The functional material according to claim 57 wherein metal-insulator phase transition is controlled.

60. A functional material including in at least a portion thereof a multiply-complexed one-dimensional structure having a hierarchical structure in which a linear structure as an element of a one-dimensional structure having a finite curvature is made of thinner one-dimensional structures having a finite curvature, characterized in:

said multiply-complexed one-dimensional structure exhibiting a nature regulated by setting the curvature used when the one-dimensional structure is made of thinner one-dimensional structures.

61. The functional material according to claim 60 wherein the curvature used when a one-dimensional structure of a first layer is made of a thinner one-dimensional structure of a second layer lower by one stage than said first layer is set to a value different from the curvature used when a one-dimensional structure of a third layer different from the first layer is made of a one-dimensional structure of a fourth layer lower by one stage than said third layer.

62. The functional material according to claim 60 wherein said curvature is set to vary in value depending on the difference in position in the one-dimensional structure of the layer.

63. The functional material according to claim 60 wherein there is a fluctuation in bonding site between said at least two layers of one-dimensional structures.

64. The functional material according to claim 63 wherein said fluctuation appears in a predetermined pitch.

65. The functional material according to claim 63 wherein said fluctuation is introduced by

removing or adding a bond between said at least two layers of one-dimensional structures.

66. The functional material according to claim 60 wherein said curvature is variable.

67. The functional material according to claim 60 wherein said one-dimensional structure is formed of a linear structure having an atom or a cluster of atoms as an element thereof.

68. The functional material according to claim 63 wherein said one-dimensional structure is formed of a linear structure having an atom or a cluster of atoms as an element thereof, and said fluctuation is introduced by random absorption or desorption of molecules to or from said linear structure.

69. The functional material according to claim 60 wherein phase transition occurs.

70. The functional material according to claim 60 wherein metal-insulator phase transition occurs.

71. The functional material according to claim 60 characterized in including a portion in a metallic phase and a portion in an insulating phase.

72. The functional material according to claim 60 characterized in including a portion in a metallic phase and a portion in an insulating phase, said portion in an insulating phase being changeable to

a metallic phase.

73. The functional material according to claim 60 wherein phase transition occurring therein is controlled by controlling the bonding site between said at least two layers of one-dimensional structures.

74. The functional material according to claim 73 wherein the control of the bonding site between said at least two layers of one-dimensional structures is effected by parallel movement of the bond.

75. The functional material according to claim 60 wherein ferromagnetic phase transition occurs.

76. The functional material according to claim 75 wherein critical temperature for ferromagnetic transition occurring therein is regulated by setting said curvature.

77. A functional material including in at least a portion thereof a multiply-complexed one-dimensional structure having a hierarchical structure in which a linear structure as an element of a one-dimensional structure having a finite curvature is made of thinner one-dimensional structures having a finite curvature, characterized in:

said multiply-complexed one-dimensional structure having a dimensionality regulated by setting a curvature in case the one-dimensional structure is made of thinner one-dimensional structures.

78. The functional material according to claim 77 wherein phase transition occurring therein is controlled by controlling the bonding site between said at least two layers of one-dimensional structures.

79. The functional material according to claim 78 wherein the control of the bonding site between said at least two layers of one-dimensional structures is effected by parallel movement of the bond.

80. A multiply-twisted helix having a hierarchical structure in which a linear structure as an element of a spiral structure is made of thinner spiral structures, characterized in:

at least two layers of spiral structures being bonded in at least one site.

81. The multiply-twisted helix according to claim 80 wherein there is a fluctuation in bonding site between said at least two layers of spiral structures.

82. The multiply-twisted helix according to claim 81 wherein said fluctuation appears in a predetermined pitch.

83. The multiply-twisted helix according to claim 81 wherein said fluctuation is introduced by removing or adding a bond between said at least two layers of spiral structures.

84. The multiply-twisted helix according to claim 83 wherein critical temperature for ferromagnetic

phase transition occurring therein is regulated by the degree of said fluctuation.

85. The multiply-twisted helix according to claim 81 wherein phase transition occurring therein is controlled by controlling the bonding site between said at least two layers of spiral structures.

86. The multiply-twisted helix according to claim 85 wherein the control of the bonding site between said at least two layers of spiral structures is effected by parallel movement of the bond.

87. The multiply-twisted helix according to claim 86 wherein critical temperature for ferromagnetic transition occurring therein is regulated by parallel movement of the bond between said at least two layers of spiral structures.

88. The multiply-twisted helix according to claim 80 wherein the bonding itself in said at least one site is made of a linear structure.

89. The multiply-twisted helix according to claim 88 wherein critical temperature for ferromagnetic transition occurring therein is regulated.

90. The multiply-twisted helix according to claim 88 wherein critical temperature for ferromagnetic phase transition is regulated by selecting an intensity of the bond made by said linear structure.

91. The multiply-twisted helix according to claim 88 wherein a quantum chaos occurring therein is

controlled.

92. The multiply-twisted helix according to claim 88 wherein an electron state thereof is controlled.

93. The multiply-twisted helix according to claim 92 wherein metal-insulator phase transition is controlled.

94. The multiply-twisted helix according to claim 80 wherein the bonding in said at least one site is made via an independent element.

95. The multiply-twisted helix according to claim 94 wherein critical temperature for ferromagnetic transition occurring therein is regulated.

96. The multiply-twisted helix according to claim 94 wherein a physical property stable against small structural fluctuation is derived by a criticality obtained by the structure.

97. The multiply-twisted helix according to claim 94 wherein a quantum chaos occurring therein is controlled.

98. The multiply-twisted helix according to claim 94 wherein metal-insulator phase transition is controlled.

99. The multiply-twisted helix according to claim 94 wherein an electron state thereof is controlled.

100. The multiply-twisted helix according to

claim 98 wherein metal-insulator phase transition is controlled.

101. A multiply-twisted helix having a hierarchical structure in which a linear structure as an element of a spiral structure is made of thinner spiral structures, characterized in:

exhibiting a nature regulated by setting a turn pitch in case the spiral structure is made of thinner spiral structures.

102. The multiply-twisted helix according to claim 101 wherein the turn pitch used when a spiral structure of a first layer is made of a thinner spiral structure of a second layer lower than one stage than said first layer is set to a value different from the turn pitch used when a spiral structure of a third layer different from said first layer is made of a thinner spiral structure of a fourth layer lower by one stage than said third layer.

103. The multiply-twisted helix according to claim 101 wherein said turn pitch is set to vary in value depending on the difference in position in the spiral structure of the layer.

104. The multiply-twisted helix according to claim 101 wherein there is a fluctuation in bonding site between said at least two layers of spiral structures.

105. The multiply-twisted helix according to

claim 104 wherein said fluctuation appears in a predetermined pitch.

106. The multiply-twisted helix according to claim 104 wherein said fluctuation is introduced by removing or adding a bond between said at least two layers of spiral structures.

107. The multiply-twisted helix according to claim 106 wherein critical temperature for ferromagnetic transition occurring therein is regulated by the degree of said fluctuation.

108. The multiply-twisted helix according to claim 101 wherein said turn pitch is variable.

109. The multiply-twisted helix according to claim 101 wherein said spiral structure is formed of a linear structure having an atom or a cluster of atoms as an element thereof.

110. The multiply-twisted helix according to claim 104 wherein said spiral structure is formed of a linear structure having an atom or a cluster of atoms as an element thereof, and said fluctuation is introduced by random absorption or desorption of molecules to or from said linear structure.

111. The multiply-twisted helix according to claim 101 wherein phase transition occurs.

112. The multiply-twisted helix according to claim 101 wherein metal-insulator phase transition occurs.

113. The multiply-twisted helix according to claim 101 characterized in including a portion in a metallic phase and a portion in an insulating phase.

114. The multiply-twisted helix according to claim 101 characterized in including a portion in a metallic phase and a portion in an insulating phase, said portion in an insulating phase being changeable to a metallic phase.

115. The multiply-twisted helix according to claim 101 wherein phase transition occurring therein is controlled by controlling the bonding site between said at least two layers of spiral structures.

116. The multiply-twisted helix according to claim 115 wherein the control of the bonding site between said at least two layers of spiral structures is effected by parallel movement of the bond.

117. The multiply-twisted helix according to claim 101 wherein ferromagnetic phase transition occurs.

118. The multiply-twisted helix according to claim 101 wherein critical temperature for ferromagnetic transition occurring therein is regulated by setting said turn pitch.

119. A multiply-twisted helix having a hierarchical structure in which a linear structure as an element of a spiral structure is made of thinner spiral structures, characterized in:

having a dimensionality regulated by setting a turn pitch in case the spiral structure is made of thinner spiral structures.

120. The multiply-twisted helix according to claim 119 wherein phase transition occurring therein is controlled by controlling the bonding site between said at least two layers of spiral structures.

121. The multiply-twisted helix according to claim 120 wherein the control of the bonding site between said at least two layers of spiral structures is effected by parallel movement of the bond.

122. A multiply-twisted helix having a hierarchical structure in which a linear structure as an element of a spiral structure is made of a thinner spiral structure, having a random potential introduced therein, and at least two spiral structures bonded in at least one site, characterized in:

a quantum chaos occurring therein being controlled by setting the intensity of said random potential, by setting the intensity of layer-to-layer bonding, by setting the turn pitch used when forming the spiral structure from thinner spiral structures, or by adding a magnetic impurity.

123. The multiply-twisted helix according to claim 122 wherein a quantum chaos occurring therein is controlled by setting the intensity of layer-to-layer bonding.

124. A multiply-twisted helix having a hierarchical structure in which a linear structure as an element of a spiral structure is made of a thinner spiral structure, and having at least two layers of spiral structures bonded in at least one site, characterized in:

the bonding performance between linear structures as elements of said spiral structure being controlled by a turn pitch in case of forming said spiral structure from thinner spiral structures, by the bonding force between said layers, or by a fluctuation in the bonding site between said at least two layers of spiral structures.

125. A functional material including in at least a portion thereof a multiply-twisted helix having a hierarchical structure in which a linear structure as an element of a spiral structure is made of thinner spiral structures, characterized in:

at least two layers of spiral structures in said multiply-twisted helix being bonded in at least one site.

126. The functional material according to claim 125 wherein there is a fluctuation in bonding site between said at least two layers of spiral structures.

127. The functional material according to claim 126 wherein said fluctuation appears in a

predetermined pitch.

128. The functional material according to claim 126 wherein said fluctuation is introduced by removing or adding a bond between said at least two layers of spiral structures.

129. The functional material according to claim 125 wherein phase transition occurring therein is controlled by controlling the bonding site between said at least two layers of spiral structures.

130. The functional material according to claim 129 wherein the control of the bonding site between said at least two layers of spiral structures is effected by parallel movement of the bond.

131. The functional material according to claim 125 wherein the bonding itself in said at least one site is made of a linear structure.

132. The functional material according to claim 131 wherein critical temperature for ferromagnetic transition occurring therein is regulated.

133. The functional material according to claim 131 wherein critical temperature for ferromagnetic phase transition is regulated by selecting an intensity of the bond made by said linear structure.

134. The functional material according to claim 131 wherein a quantum chaos occurring therein is

controlled.

135. The functional material according to claim 131 wherein an electron state thereof is controlled.

136. The functional material according to claim 135 wherein metal-insulator phase transition is controlled.

137. The functional material according to claim 125 wherein the bonding in said at least one site is made via an independent element.

138. The functional material according to claim 137 wherein critical temperature for ferromagnetic transition occurring therein is regulated.

139. The functional material according to claim 137 wherein a physical property stable against small structural fluctuation is derived by a criticality obtained by the structure.

140. The functional material according to claim 137 wherein a quantum chaos occurring therein is controlled.

141. The functional material according to claim 137 wherein metal-insulator phase transition is controlled.

142. The functional material according to claim 137 wherein an electron state thereof is controlled.

143. The functional material according to claim 141 wherein metal-insulator phase transition is controlled.

144. A functional material including in at least a part thereof a multiply-twisted helix having a hierarchical structure in which a linear structure as an element of a spiral structure is made of thinner spiral structures, characterized in:

said multiply-twisted helix exhibiting a nature regulated by setting a turn pitch produced when the spiral structure is made of thinner spiral structures.

145. The functional material according to claim 144 wherein the turn pitch used when a spiral structure of a first layer is made of a thinner spiral structure of a second layer lower than one stage than said first layer is set to a value different from the turn pitch used when a spiral structure of a third layer different from said first layer is made of a thinner spiral structure of a fourth layer lower by one stage than said third layer.

146. The functional material according to claim 144 wherein said turn pitch is set to vary in value depending on the difference in position in the spiral structure of the layer.

147. The functional material according to claim 144 wherein there is a fluctuation in bonding

site between said at least two layers of spiral structures.

148. The functional material according to claim 147 wherein said fluctuation appears in a predetermined pitch.

149. The functional material according to claim 147 wherein said fluctuation is introduced by removing or adding a bond between said at least two layers of spiral structures.

150. The functional material according to claim 144 wherein said turn pitch is variable.

151. The functional material according to claim 144 wherein said spiral structure is formed of a linear structure having an atom or a cluster of atoms as an element thereof.

152. The functional material according to claim 147 wherein said spiral structure is formed of a linear structure having an atom or a cluster of atoms as an element thereof, and said fluctuation is introduced by random absorption or desorption of molecules to or from said linear structure.

153. The functional material according to claim 144 wherein phase transition occurs.

154. The functional material according to claim 144 wherein metal-insulator phase transition occurs.

155. The functional material according to

claim 144 characterized in including a portion in a metallic phase and a portion in an insulating phase.

156. The functional material according to claim 144 characterized in including a portion in a metallic phase and a portion in an insulating phase, said portion in an insulating phase being changeable to a metallic phase.

157. The functional material according to claim 144 wherein phase transition occurring therein is controlled by controlling the bonding site between said at least two layers of spiral structures.

158. The functional material according to claim 157 wherein the control of the bonding site between said at least two layers of spiral structures is effected by parallel movement of the bond.

159. The functional material according to claim 144 wherein ferromagnetic phase transition occurs.

160. The functional material according to claim 144 wherein critical temperature for ferromagnetic transition occurring therein is regulated by setting said turn pitch.

161. A functional material including in at least a part thereof a multiply-twisted helix having a hierarchical structure in which a linear structure as an element of a spiral structure is made of thinner spiral structures, characterized in:

said multiply-twisted helix having a dimensionality regulated by setting a turn pitch in case the spiral structure is made of thinner spiral structures.

162. The functional material according to claim 161 wherein phase transition occurring therein is controlled by controlling the bonding site between said at least two layers of spiral structures.

163. The functional material according to claim 162 wherein the control of the bonding site between said at least two layers of spiral structures is effected by parallel movement of the bond.

164. A multiply-looped ring structure having a hierarchical structure in which an annular structure as an element of a ring structure is made of a thinner ring structure, characterized in:

at least two layers of ring structures being bonded in at least one site.

165. The multiply-looped ring structure according to claim 164 wherein there is a fluctuation in bonding site between said at least two layers of ring structures.

166. The multiply-looped ring structure according to claim 165 wherein said fluctuation appears in a predetermined pitch.

167. The multiply-looped ring structure according to claim 165 wherein said fluctuation is

introduced by removing or adding a bond between said at least two layers of ring structures.

168. The multiply-looped ring structure according to claim 164 wherein phase transition occurring therein is controlled by controlling the bonding site between said at least two layers of ring structures.

169. The multiply-looped ring structure according to claim 168 wherein the control of the bonding site between said at least two layers of ring structures is effected by parallel movement of the bond.

170. The multiply-looped ring structure according to claim 169 wherein the bonding itself in said at least one site is made of a linear structure.

171. The multiply-looped ring structure according to claim 170 wherein critical temperature for ferromagnetic transition occurring therein is regulated.

172. The multiply-looped ring structure according to claim 170 wherein critical temperature for ferromagnetic phase transition is regulated by selecting an intensity of the bond made by said linear structure.

173. The multiply-looped ring structure according to claim 170 wherein a quantum chaos occurring therein is controlled.

174. The multiply-looped ring structure according to claim 170 wherein an electron state thereof is controlled.

175. The multiply-looped ring structure according to claim 170 wherein metal-insulator phase transition is controlled.

176. The multiply-looped ring structure according to claim 169 wherein the bonding itself in said at least one site is made via an independent element.

177. The multiply-looped ring structure according to claim 176 wherein critical temperature for ferromagnetic transition occurring therein is regulated.

178. The multiply-looped ring structure according to claim 176 wherein a physical property stable against small structural fluctuation is derived by a criticality obtained by the structure.

179. The multiply-looped ring structure according to claim 176 wherein a quantum chaos occurring therein is controlled.

180. The multiply-looped ring structure according to claim 176 wherein metal-insulator phase transition is controlled.

181. The multiply-looped ring structure according to claim 176 wherein an electron state thereof is controlled.

182. The multiply-looped ring structure according to claim 180 wherein metal-insulator phase transition is controlled.

183. A multiply-looped ring structure having a hierarchical structure in which a linear structure as an element of a ring structure is made of a thinner ring structure, characterized in:

exhibiting a nature regulated by setting a number of elements in case the ring structure is made of thinner ring structures.

184. The multiply-looped ring structure according to claim 183 wherein the number of elements used when a ring structure of a first layer is made of a thinner ring structure of a second layer lower by one stage than said first layer is set to a value different from the number of elements used when a ring structure of a third layer different from the first layer is made of a ring structure of a fourth layer lower by one stage than said third layer.

185. The multiply-looped ring structure according to claim 183 wherein said number of elements is set to vary in value depending on the difference in position in the ring structure of the layer.

186. The multiply-looped ring structure according to claim 183 wherein there is a fluctuation in bonding site between said at least two layers of ring structures.

187. The multiply-looped ring structure according to claim 186 wherein said fluctuation appears in a predetermined pitch.

188. The multiply-looped ring structure according to claim 186 wherein said fluctuation is introduced by removing or adding a bond between said at least two layers of ring structures.

189. The multiply-looped ring structure according to claim 183 wherein said number of elements is variable.

190. The multiply-looped ring structure according to claim 183 wherein said ring structure is formed of a linear structure having an atom or a cluster of atoms as an element thereof.

191. The multiply-looped ring structure according to claim 186 wherein said ring structure is formed of a linear structure having an atom or a cluster of atoms as an element thereof, and said fluctuation is introduced by random absorption or desorption of molecules to or from said linear structure.

192. The multiply-looped ring structure according to claim 183 wherein phase transition occurs.

193. The multiply-looped ring structure according to claim 183 wherein metal-insulator phase transition occurs.

194. The multiply-looped ring structure

according to claim 183 characterized in including a portion in a metallic phase and a portion in an insulating phase.

195. The multiply-looped ring structure according to claim 183 characterized in including a portion in a metallic phase and a portion in an insulating phase, said portion in an insulating phase being changeable to a metallic phase.

196. The multiply-looped ring structure according to claim 183 wherein phase transition occurring therein is controlled by controlling the bonding site between said at least two layers of ring structures.

197. The multiply-looped ring structure according to claim 196 wherein the control of the bonding site between said at least two layers of ring structures is effected by parallel movement of the bond.

198. The multiply-looped ring structure according to claim 183 wherein ferromagnetic phase transition occurs.

199. The multiply-looped ring structure according to claim 183 wherein critical temperature for ferromagnetic transition occurring therein is regulated by setting said number of elements.

200. A multiply-looped ring structure having a hierarchical structure in which a linear structure as

an element of a ring structure is made of a thinner ring structure, characterized in:

having a dimensionality regulated by setting a number of elements in case the ring structure is made of thinner ring structures.

201. The multiply-looped ring structure according to claim 200 wherein phase transition occurring therein is controlled by controlling the bonding site between said at least two layers of ring structures.

202. The multiply-looped ring structure according to claim 201 wherein the control of the bonding site between said at least two layers of ring structures is effected by parallel movement of the bond.

203. A multiply-looped ring structure having a hierarchical structure in which a linear structure as an element of a ring structure is made of a thinner ring, having a random potential introduced therein, and at least two ring structures bonded in at least one site, characterized in:

a quantum chaos occurring therein being controlled by setting the intensity of said random potential, by setting the intensity of layer-to-layer bonding, by setting the number elements used when forming the ring structure from thinner ring structures, or by adding a magnetic impurity.

204. A functional material including in at least a portion thereof a multiply-looped ring structure having a hierarchical structure in which a linear structure as an element of a ring structure is made of thinner ring structures, characterized in:

at least two layers of said ring structures being bonded to each other in at least one site.

205. The functional material according to claim 204 wherein there is a fluctuation in bonding site between said at least two layers of ring structures.

206. The functional material according to claim 205 wherein said fluctuation appears in a predetermined pitch.

207. The functional material according to claim 205 wherein said fluctuation is introduced by removing or adding a bond between said at least two layers of ring structures.

208. The functional material according to claim 205 wherein phase transition occurring therein is controlled by controlling the bonding site between said at least two layers of ring structures.

209. The functional material according to claim 208 wherein the control of the bonding site between said at least two layers of ring structures is effected by parallel movement of the bond.

210. The functional material according to

claim 204 wherein the bonding itself in said at least one site is made of a linear structure.

211. The functional material according to claim 210 wherein critical temperature for ferromagnetic transition occurring therein is regulated.

212. The functional material according to claim 210 wherein critical temperature for ferromagnetic phase transition is regulated by selecting an intensity of the bond made by said linear structure.

213. The functional material according to claim 210 wherein a quantum chaos occurring therein is controlled.

214. The functional material according to claim 210 wherein an electron state thereof is controlled.

215. The functional material according to claim 214 wherein metal-insulator phase transition is controlled.

216. The functional material according to claim 204 wherein the bonding in said at least one site is made via an independent element.

217. The functional material according to claim 216 wherein critical temperature for ferromagnetic transition occurring therein is regulated.

218. The functional material according to claim 216 wherein a physical property stable against small structural fluctuation is derived by a criticality obtained by the structure.

219. The functional material according to claim 216 wherein a quantum chaos occurring therein is controlled.

220. The functional material according to claim 216 wherein metal-insulator phase transition is controlled.

221. The functional material according to claim 216 wherein an electron state thereof is controlled.

222. The functional material according to claim 220 wherein metal-insulator phase transition is controlled.

223. A functional material including in at least a portion thereof a multiply-looped ring structure having a hierarchical structure in which a linear structure as an element of a ring structure is made of thinner ring structures, characterized in:

said multiply-looped ring structure exhibiting a nature regulated by setting the number of elements used when the ring structure is made of thinner ring structures.

224. The functional material according to claim 223 wherein the number of elements used when a

ring structure of a first layer is made of a thinner ring structure of a second layer lower by one stage than said first layer is set to a value different from the number of elements used when a ring structure of a third layer different from the first layer is made of a ring structure of a fourth layer lower by one stage than said third layer.

225. The functional material according to claim 223 wherein said number of elements is set to vary in value depending on the difference in position in the ring structure of the layer.

226. The functional material according to claim 223 wherein there is a fluctuation in bonding site between said at least two layers of ring structures.

227. The functional material according to claim 226 wherein said fluctuation appears in a predetermined pitch.

228. The functional material according to claim 226 wherein said fluctuation is introduced by removing or adding a bond between said at least two layers of ring structures.

229. The functional material according to claim 223 wherein said number of elements is variable.

230. The functional material according to claim 223 wherein said ring structure is formed of a linear structure having an atom or a cluster of atoms

as an element thereof.

231. The functional material according to claim 226 wherein said ring structure is formed of a linear structure having an atom or a cluster of atoms as an element thereof, and said fluctuation is introduced by random absorption or desorption of molecules to or from said linear structure.

232. The functional material according to claim 223 wherein phase transition occurs.

233. The functional material according to claim 223 wherein metal-insulator phase transition occurs.

234. The functional material according to claim 223 characterized in including a portion in a metallic phase and a portion in an insulating phase.

235. The functional material according to claim 223 characterized in including a portion in a metallic phase and a portion in an insulating phase, said portion in an insulating phase being changeable to a metallic phase.

236. The functional material according to claim 223 wherein phase transition occurring therein is controlled by controlling the bonding site between said at least two layers of ring structures.

237. The functional material according to claim 236 wherein the control of the bonding site between said at least two layers of ring structures is

effected by parallel movement of the bond.

238. The functional material according to claim 223 wherein ferromagnetic phase transition occurs.

239. The functional material according to claim 238 wherein critical temperature for ferromagnetic transition occurring therein is regulated by setting said number of elements.

240. A functional material including in at least a portion thereof a multiply-loop ring structure having a hierarchical structure in which a linear structure as an element of a ring structure is made of thinner ring structures, characterized in:

said multiply-looped ring structure having a dimensionality regulated by setting a number of elements in case the ring structure is made of thinner ring structures.

241. The functional material according to claim 240 wherein phase transition occurring therein is controlled by controlling the bonding site between said at least two layers of ring structures.

242. The functional material according to claim 241 wherein the control of the bonding site between said at least two layers of ring structures is effected by parallel movement of the bond.